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US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY DOCKET NUMBER
2001-0506ATRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. §371U.S. APPLICATION NO.
(if known, see 37 CFR 1.55)
NEW 09/830675International Application No.
PCT/JP00/05853International Filing Date
August 30, 2000Priority Date Claimed
August 31, 1999

Title of Invention

OPTICAL DISC APPARATUS AND CONTROL METHOD THEREOF


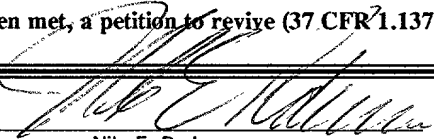
Applicant(s) For DO/EO/US
Masaki TOYOTA

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. §371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. §371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. §371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. §371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. §371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau. **ATTACHMENT A**
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. §371(c)(2)). **ATTACHMENT B**
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3)).
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19.
9. ☒ An oath or declaration (unexecuted) of the inventor(s) (35 U.S.C. §371(c)(4)). **ATTACHMENT C**
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. §371(c)(5)).

Items 11. to 14. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98. **ATTACHMENT D**
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment. **ATTACHMENT E**
 - ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☒ Other items or information: Notification Concerning Submission or Transmittal of Priority Document - **ATTACHMENT F**

U.S. APPLICATION NO. 09/830675 NEW		INTERNATIONAL APPLICATION NO. PCT/JP00/05853		ATTORNEY'S DOCKET NO. 2001-0506A					
15. <input checked="" type="checkbox"/> The following fees are submitted BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)): Neither international preliminary examination fee nor international search fee paid to USPTO and International Search Report not prepared by the EPO or JPO \$1000.00 International Search Report has been prepared by the EPO or JPO \$ 860.00 International preliminary examination fee not paid at USPTO but international search paid to USPTO \$ 710.00 International preliminary examination fee paid to USPTO but claims did not satisfy provisions of PCT Article 33(1)-(4) \$ 690.00 International preliminary examination fee paid at USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$ 100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">CALCULATIONS</th> <th style="width: 50%;">PTO USE ONLY</th> </tr> <tr> <td style="height: 100px; vertical-align: bottom;">\$860.00</td> <td></td> </tr> </table>		CALCULATIONS	PTO USE ONLY	\$860.00	
CALCULATIONS	PTO USE ONLY								
\$860.00									
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$					
Claims	Number Filed	Number Extra	Rate						
Total Claims	20 -20 =		X \$18.00	\$					
Independent Claims	2 - 3 =		X \$80.00	\$					
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$					
TOTAL OF ABOVE CALCULATIONS =				\$860.00					
<input type="checkbox"/> Small Entity Status is hereby asserted. Above fees are reduced by 1/2.				\$					
SUBTOTAL =				\$860.00					
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+					
TOTAL NATIONAL FEE =				\$860.00					
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40 per property +				\$					
TOTAL FEES ENCLOSED =				\$860.00					
				Amount to be refunded	\$				
				Amount to be charged	\$				
a. <input checked="" type="checkbox"/> A check in the amount of \$860.00 to cover the above fees is enclosed. A duplicate copy of this form is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 23-0975 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 23-0975.									
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.									
19. CORRESPONDENCE ADDRESS <div style="text-align: center;">  000513 PATENT TRADEMARK OFFICE </div>			By:  Nils E. Pedersen, Registration No. 33,145 WENDEROTH, LIND & PONACK, L.L.P. 2033 "K" Street, N.W., Suite 800 Washington, D.C. 20006-1021 Phone: (202) 721-8200 Fax: (202) 721-8250						

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April 30, 2001

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JC08 Rec'd PCT/PTO 30 APR 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :
Masaki TOYOTA : Attn: BOX PCT
Serial No. NEW : Docket No. 2001-0506A
Filed April 30, 2001 :

OPTICAL DISC APPARATUS AND
CONTROL METHOD THEREOF
[Corresponding to PCT/JP00/05853
Filed August 30, 2000]

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents,
Washington, DC 20231

Sir:

Prior to examination of the above-referenced U.S. patent application please amend the application as follows:

IN THE CLAIMS

Please amend the claims as follows:

3. (Amended) The optical disc apparatus as defined in claim 1 in which there is provided a detection means for detecting a consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or detecting a consecutive non-recorded area where no data are recorded for a constant period of time when the laser pickup is following the track of the predetermined area,

and the control means controls the laser pickup so that it perform a hold tracking in the consecutive recorded area or in the consecutive non-recorded area when the detection means detects the consecutive recorded area or the consecutive non-recorded area.

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4. (Amended) The optical disc apparatus as defined in claim 3 in which the control means performs a control of switching of rotation speed of the optical disc at the hold tracking.

5. (Amended) The optical disc apparatus as defined in claim 3 in which when the detection means receives next command while detecting the consecutive recorded area or the consecutive non-recorded area on the optical disc, the detection means interrupts the detection immediately.

8. (Amended) The method for controlling the optical disc apparatus as defined in claim 6 which detects the consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or the consecutive non-recorded area where no data are recorded for a constant period of time in the first step, when the laser pickup is following the track of the predetermined area,

an which performs the hold tracking in the consecutive recorded area or in the consecutive non-recorded area in the second step when the consecutive recorded area or the consecutive non-recorded area is detected in the first step.

10. (Amended) The method for controlling the optical disc apparatus as defined in claim 8 in which when receiving next command while detecting the consecutive recorded area or the consecutive non-recorded area in the first step, the detection is interrupted immediately.

Please add the following new claims:

11. The optical disc apparatus as defined in claim 4 in which when the detection means receives next command while detecting the consecutive recorded area or the consecutive non-recorded area on the optical disc, the detection means interrupts the detection immediately.

12. The optical disc apparatus as defined in claim 2 in which there is provided a detection means for detecting a consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or detecting a consecutive non-recorded area where no data are recorded for a constant period of time when the laser pickup is following the track of the predetermined area,

and the control means controls the laser pickup so that it perform a hold tracking in the consecutive recorded area or in the consecutive non-recorded area when the detection means detects the consecutive recorded area or the consecutive non-recorded area.

13. The optical disc apparatus as defined in claim 12 in which the control means performs a control of switching of rotation speed of the optical disc at the hold tracking.

14. The optical disc apparatus as defined in claim 13 in which when the detection means receives next command while detecting the consecutive recorded area or the consecutive non-recorded area on the optical disc, the detection means interrupts the detection immediately.

15. The optical disc apparatus as defined in claim 12 in which when the detection means receives next command while detecting the consecutive recorded area or the consecutive non-recorded area on the optical disc, the detection means interrupts the detection immediately.

16. The method for controlling the optical disc apparatus as defined in claim 9 in which when receiving next command while detecting the consecutive recorded area or the consecutive non-recorded area in the first step, the detection is interrupted immediately.

17. The method for controlling the optical disc apparatus as defined in claim 7 which detects the consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or the consecutive non-recorded area where no data are recorded for a

constant period of time in the first step, when the laser pickup is following the track of the predetermined area,

an which performs the hold tracking in the consecutive recorded area or in the consecutive non-recorded area in the second step when the consecutive recorded area or the consecutive non-recorded area is detected in the first step.

18.. The method for controlling the optical disc apparatus as defined in claim 17 in which the rotation speed of the optical disc is switched in the second step.

19. The method for controlling the optical disc apparatus as defined in claim 18 in which when receiving next command while detecting the consecutive recorded area or the consecutive non-recorded area in the first step, the detection is interrupted immediately.

20. The method for controlling the optical disc apparatus as defined in claim 17 in which when receiving next command while detecting the consecutive recorded area or the consecutive non-recorded area in the first step, the detection is interrupted immediately.

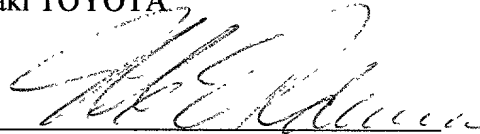
REMARKS

The present Preliminary Amendment is submitted to delete the multiple dependency of the claims, thereby placing such claims in condition for examination and reducing the required PTO filing fee.

Attached hereto is a marked-up version of the changes made to the claims by the current Preliminary Amendment. The attached page is captioned "**Version With Markings to Show Changes Made**".

Respectfully submitted,

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April 30, 2001

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3. (Amended) The optical disc apparatus as defined in claim 1 [or claim 2] in which there is provided a detection means for detecting a consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or detecting a consecutive non-recorded area where no data are recorded for a constant period of time when the laser pickup is following the track of the predetermined area,

and the control means controls the laser pickup so that it perform a hold tracking in the consecutive recorded area or in the consecutive non-recorded area when the detection means detects the consecutive recorded area or the consecutive non-recorded area.

4. (Amended) The optical [dick] disc apparatus as defined in claim 3 in which the control means performs a control of switching of rotation speed of the optical disc at the hold tracking.

5. (Amended) The optical disc apparatus as defined in claim 3 [or claim 4] in which when the detection means receives next command while detecting the consecutive recorded area or the consecutive non-recorded area on the optical disc, the detection means interrupts the detection immediately.

8. (Amended) The method for controlling the optical disc apparatus as defined in claim 6 [or claim 7] which detects the consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or the consecutive non-recorded area where no data are recorded for a constant period of time in the first step, when the laser pickup is following the track of the predetermined area,

an which performs the hold tracking in the consecutive recorded area or in the consecutive non-recorded area in the second step when the consecutive recorded area or the consecutive non-recorded area is detected in the first step.

10. (Amended) The method for controlling the optical disc apparatus as defined in claim 8 [or claim 9] in which when receiving next command while detecting the consecutive recorded area or the consecutive non-recorded area in the first step, the detection is interrupted

immediately.

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DESCRIPTION

OPTICAL DISC APPARATUS AND CONTROL METHOD THEREOF

TECHNICAL FIELD

The present invention relates to an optical disc apparatus and, more particularly, to one which realizes the stabilization of the waiting state after recording, and realize the stabilization of the switching of rotational speed.

BACKGROUND ART

As an example of the optical disc apparatus which records data into an optical disc, there is one called CD-WO (writable type) and CD-RW (rewritable type). In these apparatuses, a laser pickup is used to record data into the optical disc, and recording is started with setting the output of the laser pickup at a recording power while acquiring the time information by employing a wobble signal previously present on the optical disc.

After the completion of reading operation, the output of the laser pickup is set at a reading power and the laser pickup is returned to the location just after the reading process or to a predetermined location, thereby to hold the location information (hereinafter, referred to as "hold tracking") or switch the rotation speed. Thus, the optical disc apparatus enters a waiting

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state until next recording.

However, in the conventional optical disc apparatus, when a hold tracking is performed after the completion of recording operation, the reading of a wobble signal in a recorded part is deteriorated by the influence of RF signal in the recorded part, thereby resulting in incapability of hold tracking operation at the neighborhood of the position where the recording operation is completed.

On the other hand, when the laser pickup is sought to the lead-in area and the like after the completion of recording operation in order to perform a stable hold tracking, there is a problem in that the time required for recording should increase as a whole in a case where the seeking distance at restarting recording is long or when the seeking is performed frequently.

Further, when the switching of rotational speed is performed after the completion of recording operation, a rotational speed switching error should occur due to the presence of the RF signal, thereby interrupting next recording operation or reading operation.

The present invention is made in view of the above-mentioned problems, and has for its object to provide an optical disc apparatus which stabilize the waiting state after performing recording into an optical disc without increasing the recording time as a whole, and which realizes the stabilization of the switching of rotational speed.

DISCLOSURE OF INVENTION

According to the present invention, there is provided an optical disc apparatus which performs recording or reading of data by irradiating laser light from a laser pickup onto an optical disc and which comprises a control means for performing a play control which makes the laser pickup follow a track of a predetermined area on the optical disc after recording of data is completed, seek the head of the area when the laser pickup exceeds the area, and repeat the above-described following operation and seeking operation until a next command is issued.

Thereby, the waiting state after recording into the optical disc can be stabilized without increasing the recording time as a whole.

According to the present invention, there is provided an optical disc apparatus in which the head of the above-described area is at the neighborhood of the position where the recording operation is completed.

When the optical disc apparatus restarts the recording operation, it is possible to move in a short time to the head of the area where the recording is to be performed, thereby resulting in reducing the recording time as a whole.

According to the present invention, there is provided an optical disc apparatus provided with a detection means for detecting a consecutive recorded area where data are continuously

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recorded for a constant period of time on the optical disc or a consecutive non-recorded area where no data are recorded for a constant period of time when the laser pickup is following the track of the predetermined area, and the control means controls the laser pickup so that it should perform a hold tracking in the consecutive recorded area or in the consecutive non-recorded area instead of performing the above-described play control when the detection means detects the consecutive recorded area or the consecutive non-recorded area.

Thereby, the waiting state after performing recording into the optical disc can be stabilized without performing the following operation of the laser pickup.

According to the present invention, there is provided an optical disc apparatus in which the control means performs a control of switching of rotational speed of the optical disc at the hold tracking.

Thereby, the stabilization of the switching of rotational speed at the hold tracking can be realized.

According to the present invention, there is provided an optical disc apparatus in which when the detection means receives next command while detecting the consecutive recorded area or the consecutive non-recorded area on the optical disc, the detection means immediately interrupts the detection.

Thereby, it is possible to respond to next command issued from the host computer immediately.

Thereby, the waiting state after performing recording into the optical disc can be stabilized without increasing the recording time as a whole.

When the optical disc apparatus restarts the recording operation, it is possible to move in a short time to the head of the area where the recording is to be performed, thereby resulting in reducing the recording time as a whole.

According to the present invention, there is provided a method for controlling the optical disc apparatus which detects the consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or a consecutive

non-recorded area where no data are recorded for a constant period of time in the first step, when the laser pickup is following the track of the predetermined area, and which performs the hold tracking in the consecutive recorded area or in the consecutive non-recorded area in the second step when the consecutive recorded area or the consecutive non-recorded area is detected in the first step.

Thereby, the waiting state after performing recording into the optical disc can be stabilized without performing the following operation of the laser pickup.

According to the present invention, there is provided a method for controlling the optical disc apparatus in which the rotation speed of the optical disc is switched in the second step.

Thereby, the stabilization of the switching of rotational speed at the hold tracking can be realized.

According to the present invention, there is provided a method for controlling the optical disc apparatus in which when receiving next command while detecting the consecutive recorded area or the consecutive non-recorded area in the first step, the detection is interrupted immediately.

Thereby, it is possible to respond to a next command issued from the host computer immediately.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a block diagram illustrating the construction of

Figure 2 is a flowchart illustrating the operation of the optical disc apparatus according to the first embodiment of the present invention.

BEST MODE TO EXECUTE THE INVENTION

(Embodiment 1.)

Figure 1 is a block diagram illustrating the construction of an optical disc apparatus according to the first embodiment of the present invention.

The CPU 1 is a central arithmetic processing unit which controls the EFM encoder decoder circuit 4, the EFM wobble signal processing circuit 5, the laser control circuit 6 and the like to

perform recording of data into the optical disc apparatus 8 and reading out of data from the optical disc apparatus 8. The RAM 2 is a random access memory which can record and read data. The ROM 3 is a read-only memory which can only read data, wherein a program and the like by which the CPU 1 executes instructions are stored.

The EFM (Eight to Fourteen Modulation) encoder decoder circuit 4 receives recording data from the interface 12, converts the data, then outputs it to the EFM wobble signal processing circuit 5. Further, the EFM encoder decoder circuit 4 receives data from the EFM wobble signal processing circuit 5, converts the data, then outputs it to the interface 12.

The EFM wobble signal processing circuit 5 switches the velocity of the optical disc 8 by controlling the velocity switching circuit 11 on receipt of an instruction from the CPU 1. Further, the EFM wobble signal processing circuit 5 receives data from the EFM encoder decoder circuit 4 or the laser control circuit 6, performs D/A conversion or A/D conversion to the data, and then, outputs it to the laser control circuit 6 or the EFM encoder decoder circuit 4. Furthermore, the EFM wobble signal processing circuit 5 judges whether the signal read from the optical disc 8 is an EFM signal or not.

The laser control circuit 6 controls the laser pickup 7a and the pickup drive part 7b so that they perform recording of data into the optical disc apparatus 8 or reading of data from the optical

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disc apparatus 8. The laser pickup 7a performs recording of data into the optical disc 8 at a recording power, and performs reading of data from the optical disc 8 at a reading power. The pickup drive part 7b drives the laser pickup 7a in the radius direction of the optical disc 8. The motor 9 rotates the optical disc 8. The motor rotation control circuit 10 controls the rotation of the motor 9. The velocity switching circuit 11 switches the rotational speed of the optical disc 8 by giving an instruction to the motor rotation control circuit 10. The optical disc apparatus 13 and the host computer 14 are connected with each other through the interface 12.

Next, the operation of the optical disc apparatus 13 and a method for controlling the optical disc apparatus 13 according to the first embodiment of the present invention will be described.

When the optical disc 8 is inserted into the optical disc apparatus 13, the CPU 1 instructs the rotation control circuit 10 through the EFM wobble signal processing circuit 5 and the velocity switching circuit 11 thereby to spin up the motor 9. The laser pickup 7a irradiates laser light onto the optical disc 8 thereby to generate the RF signal which consists of the light intensity of the reflected light, and the RF signal (EFM signal) is delivered to the EFM wobble signal processing circuit 5 through the laser control circuit 6.

Figure 2 and figure 3 show flowcharts illustrating recording processes in the optical disc apparatus 13. The CPU 1 controls

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those processes directly or indirectly when nothing is particularly specified in each process. The indirect control means such a control that the CPU 1 controls the velocity switching circuit 11 through the EFM wobble signal processing circuit 5.

In step S1 shown in figure 2, the optical disc apparatus 13 starts recording of data on receipt of an instruction from the host computer 14. The CPU 1 instructs the laser control circuit 6, whereby the output of recording power is outputted from the laser pickup 7a into the optical disc 8.

In step S2, the CPU 1 makes the EFM encoder decoder circuit 4 receive the recording data from the host computer 14. The data converted in the EFM encoder decoder circuit 4 are recorded into the optical disc 8 through the EFM wobble signal processing circuit 5, the laser control circuit 6, and the laser pickup 7a.

In step S3, it is judged whether the recording of data is completed, and when the recording of data is continuing, the process of step S2 is repeated.

When the recording of data is completed, the laser control circuit 6 is controlled so as to set the laser pickup 7a at the reading power at step S4. Then, the play reproduction operation which makes the laser pickup 7a follow the track of the optical disc 8 as it is continued.

In step S5, the time information P0 which is the sum of recording completion time and 10 frames is preserved in RAM 2. By the way, "time" such as recording completion time according to the first

embodiment means time code which can be obtained from the EFM signal in the recorded area or from the wobble signal in the non-recorded area on the optical disc 8. It also has a significance as a location information (address) on the optical disc 8. By the way, while it is impossible to obtain the absolute value of the time code from the wobble signal in the non-recorded area, it is possible to obtain the relative value of the time code. However, the absolute time (absolute address) can be calculated by adding an offset value of the time code obtained from the wobble signal to the time code (recording completion time) of the location at which recording is completed. The time which is to be added to recording completion time is not required to be 10 frames if the location at which recording is completed and the location of the time information P0 are apart enough from each other so that they can be distinguished.

In step S6, it is judged whether there is a next command from the host computer 14.

When a command issued from the host computer 14 is received, it proceeds to the next process of the step S7 immediately with interrupting a series of processes.

In the case where no command is received, it proceeds to the step S8. In step S8, the signal which is read out from the optical disc 8 by the laser pickup 7a is inputted to the EFM wobble signal processing circuit 5 after being passed through the laser control circuit 6. Then, the EFM wobble signal processing circuit 5

judges whether the inputted signal is an EFM signal or not.

When the EFM signal is not inputted to the EFM wobble signal processing circuit 5, the data region read by the laser pickup 7a is in the state of non-recorded, and therefore, the EFM time counter stored in RAM 2 is cleared and the wobble time counter which is also stored in RAM 2 is added in step S9.

On the other hand, when an EFM signal is inputted to the EFM wobble signal processing circuit 5, the data region read by the laser pickup 7a is in the state of data recorded, and therefore, the wobble time counter stored in RAM 2 is cleared and the EFM time counter which is also stored in RAM 2 is added in step S10.

In step S11, it is judged whether the EFM time counter or the wobble time counter is larger than a constant value N1. The constant value N1 is previously stored in ROM 3.

When both the EFM time counter and the wobble time counter are less than the constant value N1, it is judged in step S12 if the time information of the location which is being read then is one that has passed N2 hours since the time when the recording is completed. The time information is controlled separately from the EFM time counter or the wobble time counter. This N2 is previously stored in ROM 3 as well as N1.

When N2 hours have passed since the time when recording is completed, the laser pickup 7a seeks the location which is the sum of recording completion time and 10 frames in step S13, and returns to step S6 again. When N2 hours have not passed, it returns to

step S6 with keeping the play operation.

The processes of step S8~S13 and S6 are repeated until the wobble time counter or the EFM time counter become larger than N1 hour, or next command from the host computer 14 is inputted. The play operation is continuing in the processes of step S8~S12. Because the processes of step S8~S13 and S6 are repeated, in the case where next command is issued (step S6), it is possible to proceed to the processing of the command (step S7) immediately, even when detecting the consecutive recorded area or the consecutive non-recorded area (step S8~S11). An example of the processing of the command is recording processing of data or the like.

In step S11, when EFM time counter or wobble time counter is larger than constant value N1, the time information P1 at that location is acquired at step S14. In this way, it is possible to detect the consecutive recorded area where recording state is continuing for a constant period of time N1 or detect a consecutive non-recorded area where no recording state is continuing for a constant period of time N1.

Next, in step S15, the laser pickup 7a seeks the location of the time information $(P1+P0) / 2$ which is in the center of the above-described area.

In step S16, the hold tracking processing is performed at the location of the time information $(P1+P0) / 2$. It is obvious that the recorded area and the non-recorded area are not mixed with at

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the location of the time information $(P1+P0) / 2$, whereby it is possible to perform the stable hold tracking.

In step S17, it is judged whether there is next command or not, and when there is a next command, the processing of step S7 is carried out and the processing is completed. In the case where next command is not issued, the hold tracking processing of step S16 is continued until next command is issued.

Further, it is possible to switch the rotational speed of the optical disc 8 if necessary at the hold tracking in step S16. In this location, the recorded area and the non-recorded area are not mixed as described in the above, therefore, it is possible to switch the rotational speed stably.

As shown in the above, in the optical disc apparatus 13 according to the first embodiment of the present invention, it is possible to realize a stable hold tracking, if not, it is possible to reduce a track blank occurred due to the influence of the RF signal by the play operation, whereby the waiting state after recording into the optical disc 8 can be stabilized without increasing the recording time as a whole. The said is caused by performing a processing of monitoring the presence of RF signal (EFM signal), detecting the non-recorded area continuing for a constant period of time or the recorded area continuing for a constant period of time on the optical disc apparatus 8 with the EFM wobble signal processing circuit 5 and the CPU 1 operating as a detection means, and performing a hold tracking after seeking

the above-mentioned areas, when recording operation into the optical disc 8 is completed. Or the said is caused by making a constant area perform the play operation without performing a hold tracking, seeking the recording completion location (P0) when exceeding the constant area and making the constant area perform the play operation again, and keeping the operation until next command is issued, when recording is completed.

Further, it is possible to realize the stabilization of the rotational speed by performing the hold tracking processing in the non-recorded area continuing for a constant period of time or the recorded area continuing for a constant period of time.

By the way, according to the first embodiment of the present invention, it was described in step S8~S11 and in step S14~S17 that when the EFM time counter or the wobble time counter is larger than the constant value N1, a stable hold tracking processing is performed at the location of time information $(P1+P0) / 2$ in step S8~S11 and in step S14~S17. However, it is OK only to repeat an operation of returning to the location of time information P0 when reaching the location which has passed N2 hours since the recording completion time (step S12~13) until next command is issued without performing the hold tracking processing.

Further, a constant area repeats the play operation in step S6 and step S8~S13, and the location of the head of the area on the optical disc 8 which repeats the play operation is not limited to the location of the time information P0, even when the head of

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the area is at neighborhood of the location where recording is completed.

It was described in step S16 that the hold tracking is performed at the location of the time information $(P1+P0)/2$, but it is only an example. For instance, the stable hold tracking processing can be performed at the location which is a little bit away from the time information $(P1+P0)/2$, if only the processing is performed at the location which locates between the time information $P0$ and the time information $P1$, therefore, the location at which the hold tracking processing of step S16 is performed is not limited to the location of the time information $(P1+P0)/2$.

APPLICABILITY IN INDUSTRY

As described above, the optical disc apparatus and a control method thereof according to the present invention are suitable for the optical disc apparatus which performs recording of data into a writable optical disc.

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CLAIMS

1. An optical disc apparatus which performs recording or reading of data by irradiating laser light from a laser pickup onto an optical disc and which comprises a control means for performing a play control which makes the laser pickup follow a track of a predetermined area on the optical disc after recording of data is completed, seek the head of the area when the laser pickup exceeds the area, and repeat the above-described following operation and the seeking operation until a next command is issued.

2. The optical disc apparatus as defined in claim 1 in which the head of the area is at the neighborhood of the position where the recording operation is completed.

3. The optical disc apparatus as defined in claim 1 or claim 2 in which there is provided a detection means for detecting a consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or detecting a consecutive non-recorded area where no data are recorded for a constant period of time when the laser pickup is following the track of the predetermined area,

and the control means controls the laser pickup so that it perform a hold tracking in the consecutive recorded area or in the consecutive non-recorded area when the detection means detects the consecutive recorded area or the consecutive non-recorded area.

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4. The optical disk apparatus as defined in claim 3 in which the control means performs a control of switching of rotation speed of the optical disc at the hold tracking.

5. The optical disc apparatus as defined in claim 3 or claim 4 in which when the detection means receives next command while detecting the consecutive recorded area or the consecutive non-recorded area on the optical disc, the detection means interrupts the detection immediately.

6. A method for controlling the optical disc apparatus which performs recording or reading of data by irradiating laser light onto the optical disc from the laser pickup and which comprises the first step which makes the laser pickup follow the track of the predetermined area on the optical disc after recording of data is completed, seek the head of the area when the laser pickup exceeds the area, and repeat the above-described following operation and the above-described seeking operation until a next command is issued.

7. The method for controlling the optical disc apparatus as defined in claim 6 in which the head of the area is at the neighborhood of the position where the recording operation is completed.

8. The method for controlling the optical disc apparatus as defined in claim 6 or claim 7 which detects the consecutive recorded area where data are continuously recorded for a constant period of time on the optical disc or the consecutive non-recorded area

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and which performs the hold tracking in the consecutive recorded area or in the consecutive non-recorded area in the second step when the consecutive recorded area or the consecutive non-recorded area is detected in the first step.

10. The method for controlling the optical disc apparatus as defined in claim 8 or claim 9 in which when receiving next command while detecting the consecutive recorded area or the consecutive non-recorded area in the first step, the detection is interrupted immediately.

Fig.1

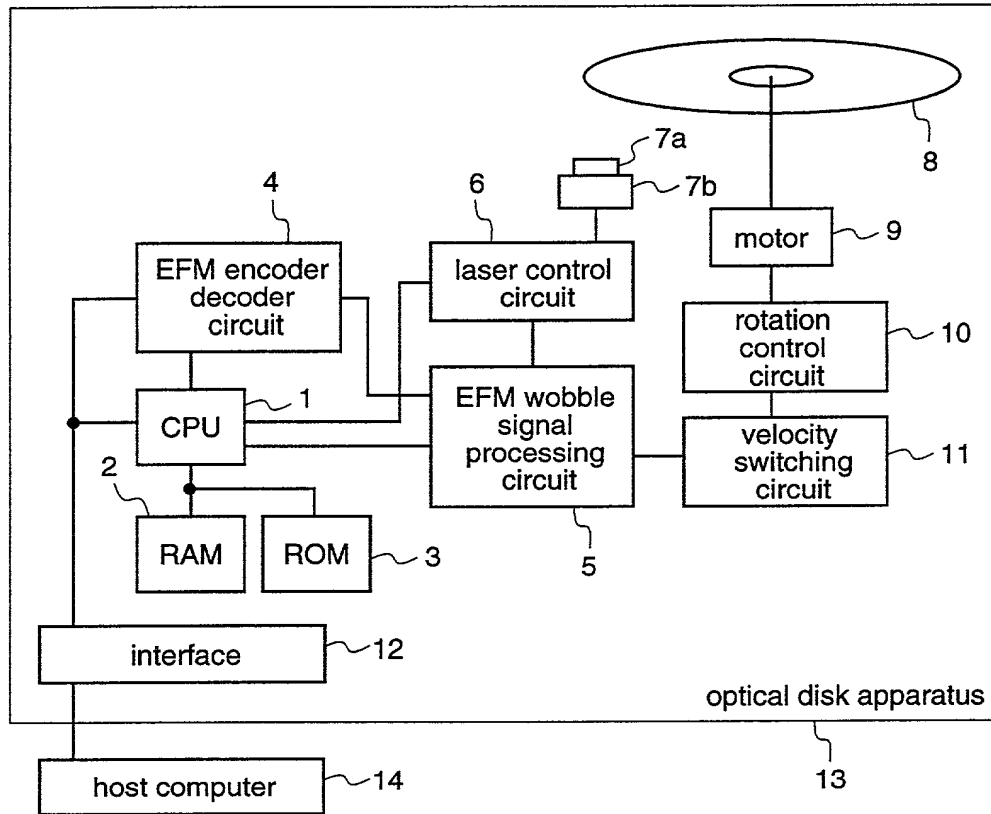


Fig.2

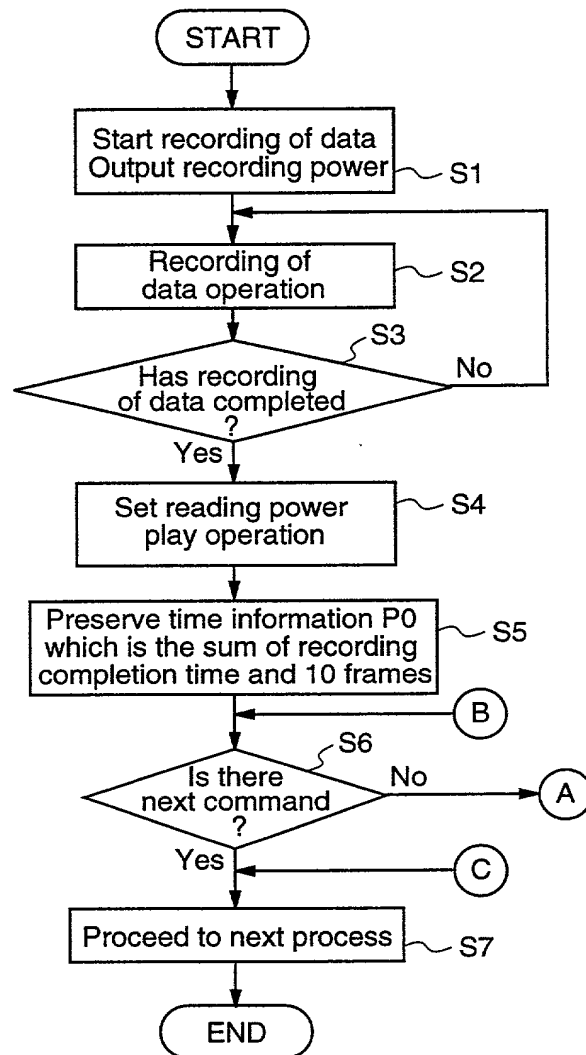
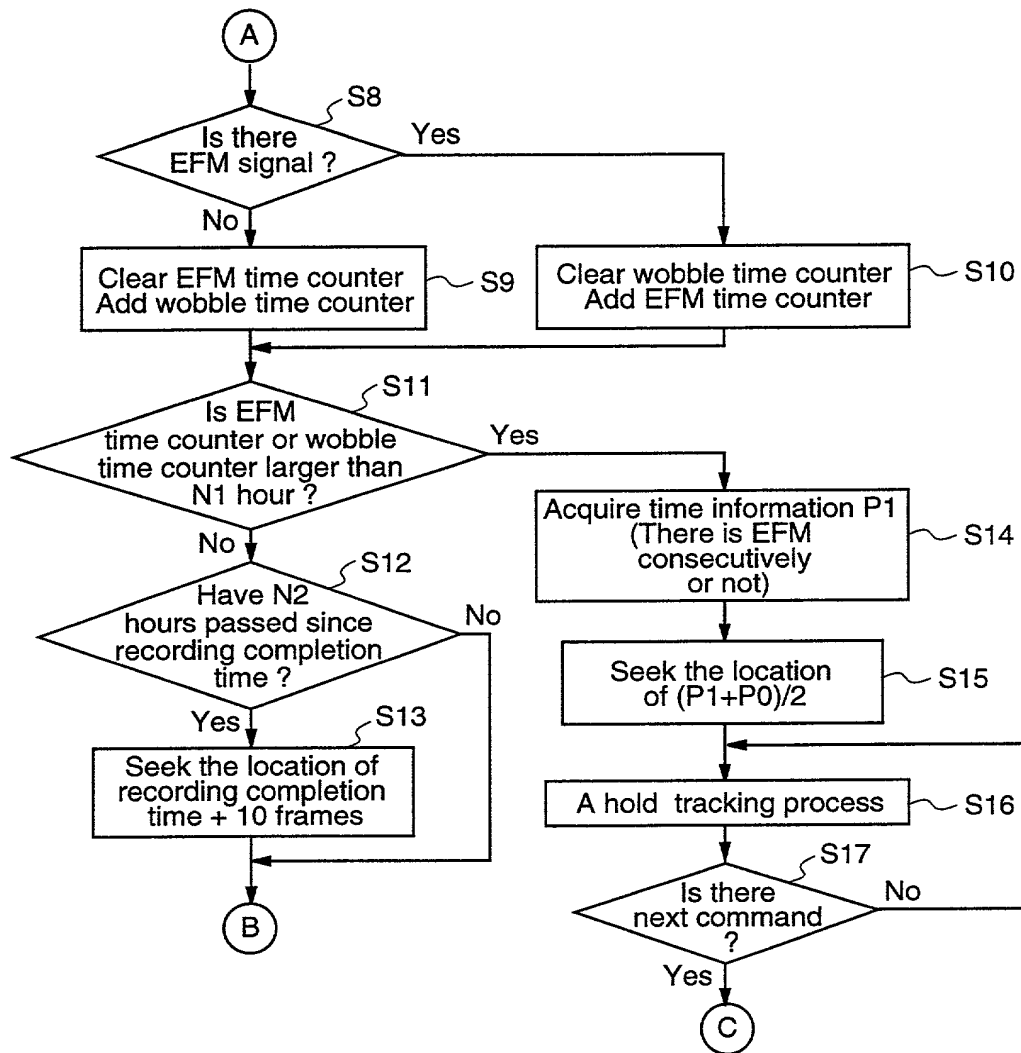


Fig.3



DECLARATION AND POWER OF ATTORNEY FOR U.S. PATENT APPLICATION

☐ Original ☐ Supplemental ☐ Substitute ☒ PCT ☐ DESIGN

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Title: OPTICAL DISC APPARATUS AND CONTROL METHOD THEREOF

of which is described and claimed in:

☐ the attached specification, or
☐ the specification in application Serial No. NEW, filed April 30, 2001, and with amendments through _____, or
☒ the specification in International Application No. PCT/JP00/05853, filed August 30, 2000, and as amended on April 30, 2001 (if applicable).

I hereby state that I have reviewed and understand the content of the above-identified specification, including the claims, as amended by any amendment(s) referred to above.

I acknowledge my duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim priority benefits under Title 35, United States Code, §119 (and §172 if this application is for a Design) of any application(s) for patent or inventor's certificate listed below and have also identified below any application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NO.	DATE OF FILING	PRIORITY CLAIMED
Japan	No.Hei.11-246355	August 31, 1999	YES

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION SERIAL NO.	U.S. FILING DATE	STATUS: PATENTED, PENDING, ABANDONED

And I hereby appoint Michael R. Davis, Reg. No. 25,134; Matthew M. Jacob, Reg. No. 25,154; Warren M. Cheek, Jr., Reg. No. 33,367; Nils Pedersen, Reg. No. 33,145; Charles R. Watts, Reg. No. 33,142; and Michael S. Huppert, Reg. No. 40,268, who together constitute the firm of WENDEROTH, LIND & PONACK, L.L.P., as well as any other attorneys and agents associated with Customer No. 000513, to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith.

I hereby authorize the U.S. attorneys and agents named herein to accept and follow instructions from HAYASE & CO. as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and myself. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by me.

Direct Correspondence to Customer No:



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Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY ZIP CODE

I further declare that all statements made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1st Inventor Masaki TOYOTA Date June 28, 2001
Masaki TOYOTA
2nd Inventor _____ Date _____
3rd Inventor _____ Date _____
4th Inventor _____ Date _____
5th Inventor _____ Date _____
6th Inventor _____ Date _____

The above application may be more particularly identified as follows:

U.S. Application Serial No. NEW Filing Date April 30, 2001

Applicant Reference Number P-23536-02 Atty Docket No. 2001-0506A

Title of Invention OPTICAL DISC APPARATUS AND CONTROL METHOD THEREOF